2004 Huntsville Modeling Workshop

Title: **Challenges in modeling the Sun-Earth System**
Objective: To advance the modeling of the coupled Sun-Earth System
Date: October 11-15, 2004
Location: Huntsville Hilton, Huntsville, Alabama
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Abstract: The transfer of mass, energy and momentum through the coupled Sun-Earth system spans a wide range of scales in time and space. While profound advances have been made in modeling isolated regions of the Sun-Earth system, minimal progress has been achieved in modeling the end-to-end system. Currently, end-to-end modeling of the Sun-Earth system is a major goal of the National Space Weather and NASA Living With a Star (LWS) programs. The uncertainty in the underlying physics responsible for coupling contiguous regions of the Sun-Earth system is recognized as a significant barrier to progress. Our limited understanding of the underlying coupling physics is illustrated by the following example questions:

- How does the propagation of a typical CME/solar flare influence the measured properties of the solar wind at 1AU?
- How does the solar wind compel the dynamic response of the Earth's magnetosphere?
- How is variability in the ionosphere-thermosphere system coupled to magnetospheric variations?

Why do these and related important questions remain unanswered? What are the primary problems that need to be resolved to enable significant progress in comprehensive modeling of the Sun-Earth system? Which model/technique improvements are required and what new data coverage is required to enable full model advances?

This workshop will be a forum for identifying and exploring promising new directions and approaches for characterizing and understanding the system. To focus the discussion, the workshop will emphasize the genesis, evolution, propagation and interaction of high-speed solar wind streamers or CME/flares with geospace and the subsequent response of geospace from its outer reaches in the magnetosphere to the lower edge of the ionosphere-mesosphere-thermosphere. Particular emphasis will be placed on modeling the coupling aspects of these phenomena across boundaries between regions and on data analysis that guides and constrains model results.